10/25/17

"Motivation gets you started, habit keeps you going."-Jim Rohn

HW: Start working on the review sheet
Test 3 on Monday 10/30
Quarter Test on Wednesday 11/8

AIM: Derivatives of "ln" and "e"

Warm Up:

$$\frac{d}{dx}[\ln x] = \frac{1}{x}, x > 0 \qquad \frac{d}{dx}[\ln u] = \frac{1}{u} \cdot \frac{du}{dx} = \frac{u'}{u}, u > 0$$

What this says is to take the derivative of the ln of some expressions, you simply use the reciprocal of the expression multipled by the derivative of that expression. The expression must be a positive number.

Find the derivative of the following expressions:

1) $y = \ln(4x)$ $\quad \frac{1}{4x} \cdot 4$

$y' = \frac{4}{4x} = \boxed{\frac{1}{x}}$

2) $y = \ln(x^2 - 3)$

$\boxed{y' = \frac{2x}{x^2-3}}$

$\ln ab$

$\ln a + \ln b$

$\ln \frac{a}{b}$

$\ln a - \ln b$

$\ln a^b$

$b \cdot \ln a$

3) $y = \ln(3x^2 - 5x + 8)$

$y' = \boxed{\frac{6x-5}{3x^2-5x+8}}$

4) $y = \ln\sqrt{x}$

$y = \ln x^{1/2}$

$y = \frac{1}{2}\ln x$

$y' = \frac{1}{2} \cdot \frac{1}{x}$

$y' = \frac{1}{2x}$

Note: #4 - Better way: $y = \ln\sqrt{x} \Rightarrow y = \ln x^{1/2} \Rightarrow y = \frac{1}{2}\ln x \Rightarrow y' = \frac{1}{2x}$

5) $y = \boxed{x^2}\boxed{\ln x}$ $\quad y' = uv' + vu'$

$u: x^2$

$u' = 2x$

$v = \ln x$

$v' = \frac{1}{x}$

$y' = x^2 \cdot \frac{1}{x} + (\ln x)(2x)$

$\boxed{y' = x + (2x)(\ln x)}$

Derivative of $\ln(f(x))$:

$$= \frac{1}{f(x)} \cdot f'(x) = \frac{f'(x)}{f(x)}$$

$$\frac{d}{dx}\left[e^x\right] = e^x \text{ and if } u \text{ is a differentiable function of } x \text{ then } \frac{d}{dx}\left[e^u\right] = e^u \frac{du}{dx}$$

"Copy" then multiply by derivative of exponent

Find the derivative dy/dx of the following expressions:

1) $y = e^{5x}$

$y' = e^{5x} \cdot 5$

$y' = 5e^{5x}$

2) $y = 4e^{1-2x}$

$y' = 4e^{1-2x} \cdot (-2)$

$y' = -8e^{1-2x}$

3) $y = e^{x^2-3x-1}$

$y' = \left(e^{x^2-3x-1}\right)(2x-3)$

$y' = (2x-3)e^{x^2-3x-1}$

4) $y = 2e^{\sqrt{x}}$

$y = 2e^{x^{\frac{1}{2}}}$

$y' = 2e^{x^{1/2}} \cdot \left(\frac{1}{2}x^{-\frac{1}{2}}\right)$

$\boxed{y' = \dfrac{2e^{\sqrt{x}}}{2\sqrt{x}}}$